AIR FORCE

QUALIFICATION TRAINING PACKAGE (AFQTP)

for

LIQUID FUEL SYSTEMS MAINTENANCE

(3E4X2)

MODULE 15

MAINTENANCE OF INSTALLED FUEL SYSTEMS

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MODULE 15

MAINTENANCE OF INSTALLED FUEL SYSTEMS

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MAINTENANCE OF INSTALLED FUEL SYSTEMS

Career Field Education and Training Plan (CFETP) references from 1 Apr 97 version.

OPR: HQ AFCESA/CEOT
AFCESA/CEO

Certified by: HQ

(Colonel Lance C. Brendel)

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AIR FORCE QUALIFICATION TRAINING PACKAGES
for
LIQUID FUEL SYSTEMS MAINTENANCE
(3E4X2)

INTRODUCTION

Before starting this AFQTP, refer to and read the "Trainee/Trainer Guide" located on the AFCESA Web site **http://www.afcesa.af.mil/**

AFQTPs are mandatory and must be completed to fulfill task knowledge requirements on core and diamond tasks for upgrade training. ***It is important for the trainer and trainee to understand*** that an AFQTP ***does not*** replace hands-on training, nor will completion of an AFQTP meet the requirement for core task certification. AFQTPs will be used in conjunction with applicable technical references and hands-on training.

AFQTPs and Certification and Testing (CerTest) must be used as minimum upgrade requirements for Diamond tasks.

MANDATORY minimum upgrade requirements:

Core task:
AFQTP completion
Hands-on certification

Diamond task:
AFQTP completion
CerTest completion (80% minimum to pass)

Note: *Trainees will receive hands-on certification training for Diamond Tasks when equipment becomes available either at home station or at a TDY location.*

Put this package to use. Subject matter experts under the direction and guidance of HQ AFCESA/CEOT revised this AFQTP. If you have any recommendations for improving this document, please contact the Career Field Manager at the address below.

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AUTOMATIC VALVES

MODULE 15 **AFQTP UNIT 1**

REPAIR (15.1.4.)

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REPAIR

Task Training Guide

STS Reference Number:	15.1.4., Repair
Training References:	• AFM 85-16, Maintenance of Petroleum Systems. • Manufacturers Manual • 3E4X2 CDCs
Prerequisites:	• Possess as a minimum a, 3E4X2 AFSC
Equipment/Tools Required:	• General tool kit • Lock out / Tag out kit
Learning Objective:	• The trainee should learn basic steps required to safely repair an automatic valve.
Samples of Behavior:	• Trainee should be able to perform a repair on an automatic valve.
Notes:	
• To successfully complete these elements follow the steps outlined in the applicable technical manual. • Any safety violation is an automatic failure.	

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REPAIR

Background: Repairs to automatic valves are made by adjusting, cleaning, repairing, and/or replacing the components. Restoring the main valve to its primary function will require troubleshooting on the part of the trainee to identify the component malfunction. Since there are so many variations of automatic valves, manufacturer's literature and CDCs should be reviewed before beginning repair. Listed in this guide are many of the components common to nearly any automatic valve found throughout the Air Force fuel systems.

NOTE:
This guide is developed for refueling control valves, defueling control valves, rate of flow control valves, and pressure relief control valves. When determining repairs, always try the easiest thing first i.e. adjusting components before replacing or opening the fuel system. Valve isolation must be completed before removing any components from the fuel system**.**

Repair Automatic Valves. Check applicable components below for possible causes and repairs.

Table 1, Automatic Valve Repairs

Component / Problem	Possible causes	Repairs
Main Valve Body	Flow Clean Strainer	Replace
	Diaphragm	Replace
	Diaphragm washers / nut	Tighten
	Disc	Flip over or replace
	Spacer washer	Replace
	Shaft	Clean or replace
	Seat	Replace
	Seat O-ring 8-16" MVB	Replace
Excess Flow shutoff	Tripped	Reset / Adjust
CDHS-3	Diaphragm	Replace
	Kinked control tubing	Replace
	O-ring	Replace
	Spring	Replace
	Gasket	Replace
	Disk assembly	Clean and Reinstall
CV Flow control	Uncontrolled Opening / Closing Rate	Adjust, disassemble and clean, or replace.
Ejector Strainer	Screens	Clean or Replace
	O-ring	Replace
	Jets	Clean

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Table 1, Automatic Valve Repairs

Component / Problem	Possible causes	Repairs
Solenoid	Retaining cap	Clean or Replace
	Coil	Replace
	Core spring	Replace
	Core assembly	Replace
	Disc holder	Replace
	Disc	Replace
	Disc spring	Replace
	Body gasket	Replace
	Wire connections	Tighten
Pressure Reducing Control	Settings	Adjust
	Diaphragm	Replace
	Disc	Flip over or Replace
	Spring	Replace
	Spring Guide	Replace
	Diaphragm Washer / Nut	Tighten or Replace
	Kinked control tubing	Replace
	Gasket	Replace
Pressure Relief Control	Settings	Adjust
	Diaphragm	Replace
	Yoke and disc Assembly	Replace
	Kinked control tubing	Replace
	Gasket	Replace
	O-ring	Replace
	Spring	Replace
	Spring Guide	Replace
	Diaphragm Washer / Nut	Tighten or Replace
	Stem	Clean / Replace
Hytrol / Hytrol Check	Diaphragm	Replace
	Disc Assembly	Replace
	Spring	Replace
	Diaphragm Washer / Nut	Tighten or Replace

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Table 1, Automatic Valve Repairs

Component / Problem	Possible causes	Repairs
Pressure Differential Control	Settings	Adjust
	Diaphragm	Replace
	Spring	Replace
	Stem	Clean / Replace
	O-ring	Replace
	Diaphragm Washer / Nut	Tighten or Replace
	Disc	Replace
	Yoke and disc Assembly	Replace
	Kinked control tubing	Replace
	Gasket	Replace
Powertrol	Diaphragm	Replace
	Disc	Replace
	Weep Hole	Clean Out
	Gasket	Replace
	Kinked control Tubing	Replace
Shuttle Valve	Teflon Coated Seal	Replace
CRA	Settings	Adjust
	Diaphragm	Replace
	Disc	Replace
	Spring	Replace
	Spring Guide	Replace / Install
	Body to Body Gasket	Replace
	O-Ring	Replace
	Kinked control Tubing	Replace
3 Way Hytrol w/ 1/8” orifice	Diaphragm	Replace
	Spring	Replace
	Disc	Replace
	Kinked control Tubing	Replace

NOTE:
After repairs are made, make necessary adjustment and perform an operational check to ensure the valve was repaired.

To perform this task, follow these steps:

Step 1: Identify the valve.

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Before adjusting, repairing, and/or replacing a component the model number of the valve must be identified. Find the model number in the manufactures technical guideance manual. Review all information before starting repairs.

Step 2: Isolate the valve.

Use Lock out/ Tag out procedures to isolate valve when replacing components on the valve.

Step 3: Remove fuel.

If possible, remove fuel from line at a drain valve or control tubing. Wear appropriate protective equipment such as gloves, goggles, and coveralls.

Step 4: Repair procedures.

Perform repair according to the manufactures technical manual.

Step 5: Open isolation valves.

Step 6: Perform operational checks on valve.

Follow the manufactures technical manual.

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Review Questions
for
Repair

Question	Answer
1. If repairs are required to an Excess flow shutoff control, what would you attempt first?	a. Install a new diaphragm. b. Reset and adjust. c. Reset the actuating arm or button. d. Clean the yoke assembly.
2. What maintenance action is required for a worn disc in the main valve body?	a. Immediately replace. b. Flip over or replace. c. Clean and re-install d. None of the above.
3. When tubing on the pressure reducing control kinked, what action would you take?	a. Un-kink the tube by hand. b. Bypass the pressure reducer. c. Increase the pressure to un-kink the tube. d. Remove and replace.
4. On most automatic valves, if diaphragms are not seated properly, what is the first action taken?	a. Replace the diaphragm b. Tighten the diaphragm washer nut. c. Invert the diaphragm. d. Apply diaphragm lubricant.

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REPAIR

Performance Checklist		
Step	**Yes**	**No**
1. Did the trainee identify the valve and use manufactures manual?		
2. Did the trainee isolate the main valve for removal or repair?		
3. Did the trainee Remove fuel?		
4. Did the trainee follow applicable manufacturer's manual during the repair process?		
5. Did the trainee Open isolation valves?		
6. Did the trainee perform an operational check after making repairs?		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.

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PUMPS

MODULE 15 AFQTP UNIT 2

ADJUST (15.2.2.)

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

ADJUST

Task training Guide

STS Reference Number:	15.2.2., Adjust
Training References:	• AFM 85-16, Maintenance of Petroleum Systems. • Manufacturers Manual • Local Procedures
Prerequisites:	• Possess as a minimum a, 3E432 AFSC
Equipment/Tools Required:	• General tool kit
Learning Objective:	• The trainee should know the basic steps required to safely adjust positive and non-positive displacement pumps.
Samples of Behavior:	• Trainee should be able to adjust positive and non-positive displacement pump.
Notes:	
• To successfully complete this element follow the steps outlined in the applicable technical manual exactly--no exceptions. • Any safety violation is an automatic failure.	

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ADJUST

Background: Pumps used for petroleum products can be classified as either positive or non positive displacement. Part one of this QTP will cover positive displacement pumps.

Positive displacement pumps are used mainly for offloading fuel and transferring to pumphouses. They are designed to pump anything that enters the inlet i.e. air, sludge, or fuel. One of the most common positive displacement pumps is the Blackmer rotary vane. Two adjustments can be performed on the Blackmer rotary vane pump; gpm delivery and pressure relief. The pump has the capacity of 250 gpm at 640 rpm or 200 gpm at 520 rpm, to change these settings the gears in the gear box must be removed and replaced with the desired ratio of gears for optimum fuel delivery. The second adjustment is an internal pressure control valve this can be set to protect downstream fuel piping by relieving excessive pressure from the discharge side of the pump, and back to the inlet side.

SAFETY:
REMOVE ALL JEWELRY BEFORE WORKING ON FUEL SYSTEMS.

NOTE:
This pump can be electrically wired to run in reverse rotation to evacuate lines or hoses. When operated in reverse, the pressure control valve will not relieve pressure.

Adjustment Procedures.

To perform this task, follow these steps:

NOTE:
Inform Fuels Control Center of required maintenance. Pump settings will be determined by base off loading requirements. Refer to manufacturers manual prior to making adjustments.

Step 1: Gauge tank designated by FCC, for fuel level reference point.

Step 2: Establish flow and time for 5 minutes.

- Deenergize pump and let the tank settle for a minimum of 30 minutes.
- Gauge the tank and calculate the gpms pumped by dividing total amount pumped by 5 minutes.

Step 3: Refer to manufacturer literature if adjustments must be made.

- If the replacement of gears is necessary, perform Lockout / Tag-out procedures. Gallons per minute adjustments are made at the pumps gearbox by removing and replacing gears.

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Step 4: Perform an operational check after the pump gears have been replaced in the gearbox. Repeat steps 2-4 to ensure accuracy of the replacement gears.

Step 5: Test the pressure control valves by establishing flow, then *slowly* close the downstream valve to prevent hydraulic shock.

- Observe the downstream pressure gauge, if an increase of pressure is observed in excess of the settings of the installed pipe pressure relief, the pressure control valve must be adjusted by turning the adjusting stem counterclockwise to decrease or clockwise to increase the pressure setting.

Step 6: Perform an operational check to ensure accuracy of adjustments.

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Review Questions
for
Adjust

Question	Answer
1. Blackmer rotary vane pumps are capable of multiple gpm's.	a. True b. False
2. What is the purpose of the gearbox?	a. Adjust upstream pressure. b. Adjust downstream pressure. c. Adjust downstream gpm's. d. Adjust upstream gpm's.
3. What is the purpose of the pressure control valve?	a. Relieve excess downstream pressure to the suction side of the pump. b. Relieve upstream pressure to the downstream side of the pump. c. Used to control upstream flow. d. Used to control upstream pressure surges.
4. Positive displacement pumps can be classified as centrifugal pumps.	a. True b. False

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ADJUST

Performance Checklist		
Step	**Yes**	**No**
1. Did the trainee gauge tank for starting fuel level reference point?		
2. Did the trainee flow fuel for five minutes, let tank settle for minimum of 30 minutes, gauge tank again and calculate difference.		
3. Did the trainee make adjustments according to the manufacturers manual at the pumps' gearbox?		
4. Did the trainee perform operational check by repeating steps 2-4?		
5. Did the trainee test the pressure control valve, adjust if necessary?		
6. Did the trainee perform operational check?		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.

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MECHANICAL SEALS

MODULE 15 **AFQTP UNIT 2**

REPLACE (15.2.4.1.)

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REPLACE

Task Training Guide

STS Reference Number:	15.2.4.1., Replace
Training References:	• AFM 85-16, Maintenance of Petroleum Systems. • Manufacturers Manual • 3E4X2 CDCs
Prerequisites:	• Possess as a minimum a, 3E4X2 AFSC
Equipment/Tools Required:	• General tool kit • Lock out / Tag out kit
Learning Objective:	• The trainee should learn the basic steps required to safely replace a mechanical seal.
Samples of Behavior:	• Trainee should be able to perform a mechanical seal replacement.
Notes:	
• To successfully complete this element follow the steps outlined in the applicable technical manual exactly--no exceptions. • Any safety violation is an automatic failure.	

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REPLACE

Background: It is possible to find many different types of mechanical seal manufacturers that make a seal for the same type of pump. Whichever one you use is entirely up to you. For this QTP the John Crane #9 mechanical seal is used as the example.

The John Crane #9 mechanical seal consists of a stationary seat (insert) mounted in the seal gland against which a corresponding rotary unit operates. The rotary unit on this type of seal consists of a seal retainer, springs, and a rotating seat made of stainless steel. The stationary seat is made of a hard, carbon-like material and is very brittle. When a mechanical seal leaks, you can try to clean and adjust it. While you have it apart, check all parts carefully for wear, nicks, and burrs. Pay particular attention to the mating surfaces of the stationary and rotary seats. If they are scratched or if the stationary seat is chipped, you must replace the entire mechanical seal. **You cannot lap them**. You will also want to check the O-ring seal installed in the stationary seat. You may need to replace only the O-ring. Replacing a mechanical seal requires strict compliance with the applicable manufacturer's instructions.

SAFETY:
REMOVE ALL JEWELRY BEFORE WORKING ON FUEL SYSTEMS. LOCK-OUT / TAG-OUT PROCEDURES.

NOTE:
Inform Fuels Control Center of required maintenance. Obtain manufacturers manuals and review CDC's. The following procedural steps pertain to vertical deep well turbine pumps with John Crane #9 mechanical seals installed.

Mechanical seal replacement Procedures.

To perform this task, follow these steps:

Step 1: Perform Lock Out / Tag Out procedures for mechanical and electrical.

Step 2: Loosen set screws on lock ring on top of the motor.

Step 3: Lower impellers slowly on to the pump bowls using adjusting nut on top of the motor.

Hint:
Before lowering impellers count the number of threads between top of nut and motor shaft. This can be used later as a reference point when raising the impellers.

NOTE:
Solid shaft motors will require you to lower the impellers using the bolts on the pump/motor shaft coupling.

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Step 4: Disconnect motor and pump shaft coupling and remove motor shaft.

Step 5: Remove seal lock ring and seal gland.

Step 6: Remove mechanical seal assembly by grasping adjusting sleeve and lifting.

Note:
Apply Teflon tape on pump shaft threads to protect the internal O-ring of the mechanical seal and for easier removal.

Step 7: Inspect and clean seal box.

Step 8: Install mechanical seal. Replace the O-ring seal in the adjusting sleeve with a new O-ring.

HINT:
Apply Teflon tape on pump shaft threads to protect the internal O-ring of the mechanical seal. Lightly coat the internal O-ring in the mechanical seal and pump shaft with oil.

NOTE:
Refer to manufacturers manual before installation.

Step 9: Inspect or replace the O-ring gasket in the seal gland and bolt the seal gland in place.

Step 10: Refer to pump manual for adjustment of impellers and mechanical seal adjustment . Use the mechanical seal adjustment QTP to refresh memory on seal adjustments .

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Review Questions
for
Replace

Question	Answer
1. When do you replace mechanical seals?	a. Every year. b. Every two years. c. On a recurring maintenance schedule. d. If scratched or if the stationary seat is chipped
2. Why is it necessary to LockOut / Tag-Out systems when replacing a mechanical seal.	a. Prevent electrical shock. b. Prevent unexpected energizing of the pump/motor. c. Prevent physical injury. d. Both B and C
3. Teflon tape, when applied to the pump shaft threads, prevents?	a. Leaks through pump shaft coupler. b. Excessive vibration during initial start-up. c. Damage to internal mechanical seal O-ring. d. Mechanical seal squealing during initial start-up.

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REPLACE

Performance Checklist		
Step	**Yes**	**No**
1. Did the trainee perform LockOut / Tag-Out safety procedures?		
2. Did the trainee loosen setscrews on the lock ring?		
3. Did the trainee lower impellers slowly on to the pump bowls using adjusting nut on top of the motor?		
4. Did the trainee disconnect motor and pump shaft coupling and remove motor shaft?		
5. Did the trainee remove seal lock ring and seal gland?		
6. Did the trainee remove mechanical seal assembly by grasping adjusting sleeve and lifting?		
7. Did the trainee inspect and clean seal box?		
8. Did the trainee install the mechanical seal?		
9. Did the trainee inspect or replace the O-ring gasket in the gasket in the seal gland and bolt the seal gland in place?		
10. Did the trainee refer to pump manual and QTP for adjustment of impellers and mechanical seal?		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.

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MECHANICAL SEALS

MODULE 15 **AFQTP UNIT 2**

ADJUST (15.2.4.2.)

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ADJUST

Task Training Guide

STS Reference Number:	15.2.4.2., Adjust
Training References:	• AFM 85-16, Maintenance of Petroleum Systems. • Manufacturers Manual • 3E4X2 CDCs
Prerequisites:	• Possess as a minmum a, 3E432 AFSC
Equipment/Tools Required:	• General tool kit • Lock out / Tag out kit
Learning Objective:	• The trainee should learn the basic steps required to safely adjust a mechanical seal.
Samples of Behavior:	• Trainee should be able to perform a mechanical seal adjustment.
Notes:	
• To successfully complete this element follow the steps outlined in the applicable technical manual exactly--no exceptions. • Any safety violation is an automatic failure.	

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ADJUST

Background: It is possible to find many different types of mechanical seal manufacturers that make a seal for the same type of pump. Whichever one you use is entirely up to you. For this QTP the John Crane #9 mechanical seal is used as the example.

The John Crane #9 mechanical seal consists of a stationary seat (insert) mounted in the seal gland against which a corresponding rotary unit operates. The rotary unit on this type of seal consists of a seal retainer, springs, and a rotating seat made of stainless steel. The stationary seat is made of a hard, carbon-like material and is very brittle. When a mechanical seal leaks, you can try to clean and adjust it. While you have it apart, check all parts carefully for wear, nicks, and burrs. Pay particular attention to the mating surfaces of the stationary and rotary seats. If they are scratched or if the stationary seat is chipped, you must replace the entire mechanical seal. **You cannot lap them**. You will also want to check the O-ring seal installed in the stationary seat. You may need to replace only the O-ring. Replacing a mechanical seal requires strict compliance with the applicable manufacturer's instructions.

SAFETY:
REMOVE ALL JEWELRY BEFORE WORKING ON FUEL SYSTEMS. THIS TASK REQUIRES LOCK-OUT / TAG-OUT PROCEDURES.

NOTE:
Coordinate with Fuels Control Center of required maintenance. Obtain manufacturers manuals, review CDCs and QTP's.

Mechanical seal adjustment procedures.

To perform this task, follow these steps:

Step 1: Perform Lock Out / Tag Out procedures for mechanical and electrical.

Step 2: Accomplish pump impeller adjustment prior to adjusting the mechanical seal.

Step 3: Install a setting gauge or spacer between the collar and seal ring to adjust spring tension.

NOTE:
If gauge is missing - use an inside caliper to measure the clearance between the collar and seal ring. Specified clearance is stamped on the collar.

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Step 4: Tighten set screws on lock ring.

Step 5: Remove setting gauge from the collar and seal ring, save the setting gauge for future use.

Step 6: Remove Lockout / Tag-out safety devices.

Step 7: Perform operational check, observing for signs of spitting and sputtering, leakage, squealing or carbon spray.

NOTE:
If operational check is successful return pump to service. If operational check is unsuccessful refer to troubleshooting guide and make necessary adjustments and/or repair

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Review Questions
for
Adjust

Question	Answer
1. Setting gauges or spacers are used for what?	a. Adjust pump b. Adjust spring tension. c. Adjust lock ring.
2. Setting gauges or spacers should be discarded in the trash.	a. True b. False
3. Performing an operational check is mandatory.	a. True b. False

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ADJUST

Performance Checklist		
Step	**Yes**	**No**
1. Did the trainee perform lockout / tag-out procedures?		
2. Did the trainee accomplish pump impeller adjustment prior to adjusting the mechanical seal?		
3. Did the trainee install a setting gauge or spacer between the collar and seal ring to adjust the spring tension?		
4. Did the trainee tighten setscrews on lock ring?		
5. Did the trainee remove setting gauge, and save for future use?		
6. Did the trainee remove lockout / tag-out?		
7. Did the trainee perform operational check, observe for: spitting and sputtering, leakage from the seal, squealing or carbon desk and review troubleshooting if problems occur?		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.

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FILTRATION EQUIPMENT

MODULE 15 **AFQTP UNIT 3**

REPLACE FILTER ELEMENT CARTRIDGES (15.3.2.)

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

REPLACE FILTER ELEMENT CARTRIDGES

Task Training Guide

STS Reference Number/Title:	15.3.2., Replace filter element cartridges
Training References:	• AFM 85-16, Maintenance of Petroleum Systems. • 3E4X2 CDC • Local Procedures
Prerequisites:	• Possess as a minimum a, 3E432 AFSC
Equipment/Tools Required:	• General tool kit • Torque wrench
Learning Objective:	• The trainee should know the basic steps required to safely replace filter elements.
Samples of Behavior:	• The trainee should be able to replace filter elements.
Notes:	
• To successfully complete this element follow the steps outlined in the applicable technical manual exactly--no exceptions. • Any safety violations are an automatic failure.	

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REPLACE FILTER ELEMENT CARTRIDGES

Background: Whether the mission is completed depends very much on the condition of the fuel delivered to the aircraft. Foreign particles mixed with the fuel can cause engine failure. Therefore, fuel for jet aircraft *must* be clean and dry. Water in jet fuel can seriously affect jet engine performance and can cause engine failure by forming ice crystals. It can even cause microbiological contamination in both storage and aircraft fuel systems. Microorganisms survive only in water. They multiply in watered fuel systems and cause serious contamination problems. Consequently, the water must be removed both in storage and during aircraft servicing.

Equally important is the removal of solid particles from the fuel. These particles damage components of fuel systems. They also damage the fuel system components of aircraft which are serviced with the contaminated fuel. Many different types of solid particles can find their way into the fuel lines. The *most* common of these are rust, scale, sand, and particles of system components that have been chipped or damaged.

Many different models of filter/separators are found at various Air Force bases. They are; however, of three basic designs: (1) military specification (MILSPEC) horizontal, (2) MILSPEC vertical, and (3) API 1581 horizontal. The model and flow rates will determine how many filter elements are in each separator..

NOTE:
If cathodic protection is installed, disconnect or shut the circuit breaker off for the duration of the maintenance.

SAFETY:
REMOVE ALL JEWELRY BEFORE WORKING WITH FUEL SYSTEMS. THIS TASK REQUIRES LOCK-OUT / TAG-OUT PROCEDURES. WEAR APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT; CLEAN RUBBER GLOVES, COVERALLS, ETC.

Filter Element Replacement Procedures.

To perform this task, follow these steps:

Step 1: Inform Fuels Control Center of the required maintenance

Step 2: Perform all Lock-Out / Tag-Out procedures **Caution:** Before you do maintenance on filter/separators, be sure that the valves in the filter/separator supply pipeline are closed and that the manual air release valve is open to remove all pressure from the vessel.

Step 3: Drain the fuel from the separator into an approved container as dictated by your local procedures

Step 4: Open separator dome cover, allow any remaining fuel to drain into bucket,

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

Step 5: Remove filter elements

Follow manufacturers manual to remove and install new elements. Use the plastic covering or wear clean rubber gloves when replacing the new elements.

Do not touch the elements with your bare hand. Oil from your hand will deteriorate the coalescing ability of the element. Coordinate with Civil Engineer Environmental section for the disposal of the used filter elements

Safety:

Follow established policies for entry into a horizontal filter separator

Step 6: Install new elements.

Install according to manufacturers manual.

Step 7: Close separator dome cover.

Tighten cover bolts to manufacturers torque specifications

Step 8: Fill separator with fuel in accordance with AFM 85-16.

Step 9: Open isolation valves.

Step 10: Pressurize vessel and check for leaks.

Step 11: Record on the vessel the next change date (month and year) and the maximum allowable differential pressure (DP).

NOTE:

Notify Fuels Control Center that the filter/separator is ready to return to service and is awaiting Quality Check flush and sample.

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

Review Questions
for
Replace Filter Element Cartridges

Question	Answer
1. Gravity filling from vessel to vessel helps eliminate static electricity.	a. True b. False
2. Installing elements using the plastic covering prevents what?	a. Deterioration of elements coalescing ability. b. Prevents water build up on the element. c. Prevents static electricity build up. d. Prevents stactic water deterioration

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

REPLACE FILTER ELEMENT CARTRIDGES

Performance Checklist		
Step	**Yes**	**No**
1. Did trainee inform Fuels Control Center of the required maintenance?		
2. Did the trainee perform Lock out/Tag out procedures?		
3. Did the trainee Drain fuel from separator?		
4. Did the trainee open dome cover?		
5. Did the trainee properly remove elements?		
6. Did the trainee install element properly?		
7. Did the trainee close separator dome?		
8. Did the trainee fill sepatator in accordance with AFM 85-16?		
9. Did the trainee open isolation valves?		
10. Did the trainee pressurize separator and check for leaks?		
11. Did the trainee record on separator the next change of date and maximum allowable DP?		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

FUEL METERS

MODULE 15 **AFQTP UNIT 4**

CALIBRATE METERS (15.4.2.)

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

CALIBRATE METERS

Task Training Guide

STS Reference Number:	15.4.2., Calibrate meters
Training References:	• AFM 85-16, Maintenance of Petroleum Systems. • 3E4X2 CDCs • Manufacturers Manual • Local Procedures
Prerequisites:	• Possess as a minimum a, 3E3X2 AFSC
Equipment/Tools Required:	• General tool kit • Master Meter • Thermometers
Learning Objective:	• The trainee should know the basic steps required to safely calibrate meters.
Samples of Behavior:	• The trainee should be able to calibrate installed meters. • The trainee should be able to properly set up fuel system, master meter and return system to normal operation when complete.
Notes:	
• To successfully complete this element follow the steps outlined in the applicable technical manual exactly--no exceptions. • Any safety violation is an automatic failure.	

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

CALIBRATE METERS

Background: The meters you will come into contact with are designed to measure the issuance of fuel or other petroleum products. You will find meters on Mogas and diesel dispensers, on master maters, and in the bulk storage area. All meters used in the Air Force liquid fuel systems are positive-displacement meters. This means that all of the liquid actually passes through the meter-measuring chamber. A fixed amount of fuel passes through the meter with each revolution of the meter's measuring mechanism. So the meter simply records the number of revolutions made by the measuring mechanism, reflecting this count in gallons. Meters are calibrated annually or if meter readings are erratic.

SAFETY:
REMOVE ALL JEWELRY BEFORE WORKING WITH FUEL SYSTEMS.

NOTE:
Coordinate with Fuels Control Center for fuel system setup i.e., control panel, manual valves, system configuration, date and time of maintenance and vehicle if required.

To perform this task, follow these steps:

Step 1: Position and connect master meter to the meter to be tested.

- Use the hose reel or hose stored on the U hooks as necessary to connect the refueling vehicle.
- Follow proper grounding and bonding procedures.
- Ensure correct valves are opened on the master meter for flow.
- Additionally, tape a thermometer to the pipeline near the installed meter..

NOTE:
Record installed register meter readings prior to the start of calibrating procedures for Petroleum Oils and Lubricants (POL) accounting purposes.

Step 2: Set system up to dispense fuel and flush the system piping and master meter with 100 gallons of fuel to remove air.

- Remember installed meters are positive displacement and would register air and fuel.
- After flushing procedures are complete, reset registers on master meter and installed meter.

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

Step 3: Set the automatic stop on the master meter to cutoff at a predetermined number of gallons (usually 600 for Liquid Controls and A.O. Smith meters or 1,000 gallons for Brodie meters).

Step 4: Energize system to dispense the set number of gallons.

-

Step 5: Deenergize system and compare the readings on both thermometers and meters.

If the temperatures are different, convert the readings to 60 degrees F. Conversion tables can be found in TO 33A6-2-3-1, CALIBRATING THE FUEL METER TANK. If you need a copy, the base fuel accounting office can supply one.

Step 6: Calibrate meter.

Calibrate installed meter using manufacturer manual, and AFM 85-16. Retest meter to ensure accuracy of calibration. Follow steps 3-5.

Step 7: Return system to original configuration, notify fuels control center of job completion, and place calibration sticker on meter.

NOTE:
All permanently installed meters are required annual calibration to within 0.2% accuracy. After calibration procedures have been completed, assist POL in returning system to original configuration to include final totalizer reading.

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

Review Questions for Calibrate Meters

Question	Answer
1. Liquid Controls and A.O. Smith meters require how many gallons for flushing the system?	a. 600 gallons b. 6000 gallons c. 100 gallons d. 1,000 gallons
2. What is the purpose of flushing the system?	a. To eliminate air and fill the lines and valves with fuel. b. To ensure the lines and valves have lubrication. c. Double check the final calibration of the installed meter. d. Double check the first calibration of the installed meter.
3. Permanently installed Brodie meters require how many tests to be properly calibrated?	a. 2 flow comparisons. b. 1 flush c. As many as needed. d. None of the above.
4. What is a thermometer used for?	a. Checking the temperature of the piping. b. Checking the temperature of the fuel. c. Check the ambient air temperature. d. Check the ambient air pressure.
5. Installed fuel meters must be calibrated to within what percentage?	a. 2.0%. b. 1.0% to 2.0% c. 0.2%. d. 1.5%
6. The final step after calibration procedures are complete are?	a. Return system to original configuration. b. Notify fuels control center of job completion. c. Place calibration sticker on meter. d. All the above.

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

CALIBRATE METERS

Performance Checklist		
Step	**Yes**	**No**
1. Master meter cart setup: a. Did the trainee ground and bond all equipment? b. Did the trainee use either the hose reel or the hose stored on the U hooks as necessary to open the flow? . c. Did the trainee connect master meter inlet hose to the system containing the meter to be tested? d. Did the trainee tape a thermometer to the pipeline near the installed meter?		
2. System setup and flush: a. Did the trainee set the system up to dispense fuel? b. Did the trainee reset the master meter and the installed meter to zero?		
3. Did the trainee set the Automatic stop to cut off at a predetermined number of gallons (Usually 600 or 1,000 gallons)?		
4. Did the trainee energize the system?		
5. Deenergize system and reading: a. Did the trainee de-energize the system? b. Did the trainee read the two thermometers? c. Did the trainee read both meters?		
6. Calibrate meter: a. Did the trainee perform calibration procedure to within 0.2% (if necessary)? b. Did the trainee retest meter to ensure accuracy?		
7. Did the trainee return system to original configuration, notify FCC, and install calibration sticker on meter?		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

PIPING SYSTEMS

MODULE 15 AFQTP UNIT 8

PERFORM PIPE THREADING (15.8.2.)

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

PERORM PIPE THREADING

Task Training Guide

STS Reference Number/Title:	15.8.2., Perform Pipe Threading
Training References:	• AFM 85-16, Maintenance of Petroleum Systems. • Local Procedures • 3E4X2 CDC
Prerequisites:	• Possess as a minimum a, 3E432 AFSC
Equipment/Tools Required:	• Eye Protection • Pipe Threader • Pipe Cutter • Reamer • 1” Black Iron Pipe • General Tool Kit
Learning Objective:	• The trainee should know the basic steps required to safely perform pipe threading.
Samples of Behavior:	• The trainee should follow the basic steps required to perform pipe threading and clean-up.
Notes:	
• To successfully complete this element follow the steps outlined in the applicable technical manual exactly--no exceptions. • Any safety violation is an automatic failure.	

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

PIPE THREADING

Background: Conveyance of fuel will demand every LFM technician to be familiar with the basics of connecting and disconnecting pipes. In order to complete this job, the need may arise to perform the task of pipe threading. Even though there are different techniques, tools and equipment for performing pipe threading, the basics are essentially the same. This AFQTP will focus on the most common "threadable" type of fuel pipe used for distribution of the product…black iron (stainless steel is also used; however, it is not "theradable").

SAFETY:
WHEN OPERATING A POWER THREADING MACHINE, GLOVES WILL NOT BE USED. THE MOVING PARTS COULD CAUSE SEVERE DAMAGE TO YOUR HAND. ADDITIONAL CARE SOULD BE TAKEN TO AVOID METAL FILINGS FROM PENETRATING THE SKIN. APPROPRIATE EYE PROTECTION MUST BE USED.

Procedures for Threading Fuel Pipe.

To perform this task, follow these steps:

Step 1: Cut pipe to appropriate length (for accurate measurements, see QTP, 15.8.3, Pipe Fitting).

Step 2: Read manufacturer's operational instructions on the type of threader you will use.
- Two methods of threading exist—by hand or with a power pipe threader. Of these, the power pipe method is easiest and fastest. Hand-threading, even though it's a little more challenging, can be mastered and will produce quality results.

Step 3: Place and secure pipe in power pipe threader.

Step 4: Perform a visual inspection of the dies for chips, damage or dullness. If any damage or excessive wear is noticed, replace them.

Step 5: Lubricate the dies with cutting oil. This serves two purposes:
- Reduces the friction induced heat.
- Ensures smooth, sharp, unmarred threads via proper lubrication.

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

Step 6: Cut threads.

- Place the end of pipe to be threaded at the mouth of the die and start the machine
- Ensure that cutting oil is flowing as the pipe is being threaded.
- Press foot pedal (or lever, depending on the power threader used).
- Observe as the threads are being cut.
- Watch for two newly cut threads to appear on the opposite side of the die.
- Remove burrs with a reamer

NOTE:
Some power threaders will automatically stop, while some will require the operator to manually stop the process. On each stroke (when cutting the threads with a manual threader), make no more than two full turns of the die, then back off (or reverse) the handle $1/2$ of a turn or more. This prevents tearing of the threads. When you stop to reverse the dies, squirt cutting oil on the dies and threads.

Step 7: Remove pipe and inspect threads

- Release the pipe from the pipe threader and inspect threads for a smooth cut.
- To further test the newly cut threads, a matching female fitting should screw onto the pipe with relative ease.

NOTE:
If 2 to 3 turns can't be made with ease (by hand), your threads may not be cut properly.

Step 8: Clean up.

- To clean up, use a wire brush to remove any metal filings from the threads or the die (use a shop broom to sweep up filings on the floor).
- Use a rag to clean up any excess oil
- Place oily rag in the appropriate container (eg. approved metal can with a lid).

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

Review Questions
For
Pipe Threading

Question	Answer
1. When operating a power threader, what should not be used?	a. Eye Protection b. Face Shield c. Steel-toe boots d. Gloves
2. What do you look for when performing a visual inspection of dies?	1. Damage 2. Dullness 3. Excessive Wear 4. All of the Above
3. The purpose of cutting oil is to reduce _____ and _____.	a. Noise and heat. b. Friction and heat. c. Friction and damage. d. Noise and damage.
4. How are burrs removed?	a. By hand b. With a die handle c. With a wire brush d. With a reamer
5. What is a good way to verify properly cut threads?	a. When two to three turns are exposed on the outside die. b. Make two to three easy turns by hand with a female fitting. c. When you can make two to three turns with a die. d. None of the above.

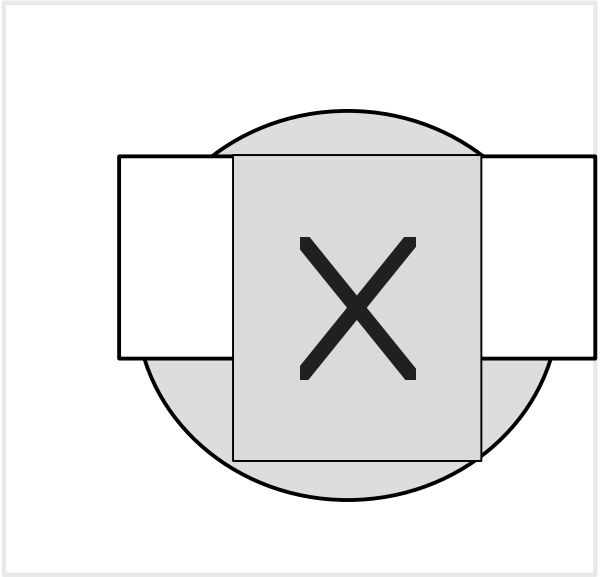
Notice. This AFQTP is ***NOT*** intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

PIPE THREADING

Performance Checklist		
Step	**Yes**	**No**
1. Did the trainee cut the pipe to an appropriate length?		
2. Did the trainee? read the manufacturer's guidance on the equipment to be used?		
3. Did the trainee secure the pipe in the pipe threader?		
5. Did the trainee inspect the condition of the dies?		
6. Did the trainee and lubricate dies as necessary?		
7. Cutting threads: a. Did the trainee place the end of pipe to be threaded at the mouth of the die and start the machine? b. Did the trainee ensure that cutting oil is flowing as the pipe is being threaded? c. Did the trainee press the foot pedal (or lever, depending on the power Threader used)? d. Did the trainee observe as the threads were being cut? e. Did the trainee watch for two newly cut threads to appear on the opposite side of the die? f. Did the trainee remove burs with a reamer?		
8. Inspect, and test new threads: a. Did trainee release pipe from threads? b. Did the trainee test newly cut threads with female fitting?		
9. Did the trainee perform proper housekeeping?		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.



PIPING SYSTEMS

MODULE 15 AFQTP UNIT 8

PERFORM PIPE FITTING (15.8.3.)

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

PERFORM PIPEFITTING

Task Training Guide

STS Reference Number/Title:	15.8.3., Perform Pipefitting
Training References:	• Local Procedures • 3E452 CDCs
Prerequisites:	• Possess as a minimum a, 3E432 AFSC.
Equipment/Tools Required:	• General tool kit, writing materials, calculator, utility blueprints, tape measure
Learning Objective:	• The trainee should know the procedures to perform pipefitting.
Samples of Behavior:	• The trainee should be able to plan, design and perform pipefitting

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

PIPEFITTING

Background: Conveyance of fuel will demand every LFM technician to be familiar with the basics of routing fuel distribution systems. In order to complete this job, each technician should be able to read and understand utility maps (blueprints). There are undoubtedly several methods for calculating, sizing, and installing piping systems; however, you will be expected to be familiar with these three: (1) End-to-end, (2) face-to-face, and (3) center-to-center. Understanding how to calculate pipe lengths will include knowing the sizes of valves, fittings, and gauges, etc. With all of this in mind, let's explore the task of pipefitting.

> **NOTE:**
> When actual measurements are being taken in the field, observe the safety practices applicable to your environment

Basic Steps To Pipefitting.
To perform the task, follow these steps:

Step 1: Preparation

- Decide if your task will involve installing, replacing, or adding to the existing system.
- Review blueprints (or as-builts) for size and resource estimates, as well as isolation valves (if necessary)

> **NOTE:**
> In the case of replacement or addition, isolation of the section you will be replacing may be necessary.

- Gather writing materials (pencil & paper), and a calculator

Step 2: Plan and sketch your work

- Visit the area and compare existing system with as-builts
- Make a single line drawing of the section to be worked on
- Add fixtures, valves, gauges, fittings, etc.
- Use your tape measure to include existing lengths on your sketch (see Step 3)
- Revise sketch to show what corrections you are planning to make

> **NOTE:**
> If the area to be repaired or installed is an active part of the fuel system, make sure you isolate the section by closing and tagging the appropriate valves.

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

Step 3: Measure Pipe

- *End-to-end method* (used for replacement of pipe sections)
  - Remove the section of pipe to be replaced
  - Simply measure from one end of the pipe to the other
  - Measure new piece to exact measurement, cut and install
- *Face-to-face* (used when measurements are made of connected pipe sections)
  - Measure from the face of one fitting to the face of another
  - Measure and assemble new section to exact measurement, and install
- *Center-to-center* (used when measurements are made of connected pipe sections)
  - Measure from the center of one fitting to the center of another
  - Measure and assemble new section to exact measurement, and install

NOTE:
If any changes are made to the previous system configuration (i.e. a new valve, re-routing, etc.), note these changes on your as-built (utility blueprints)

NOTE:
Calculating measurements using face-to-face and center-to-center methods will require additional information. The chart below provides standard information that will help to obtain more precise fit

Table 1, Pipe Sizes

Pipe size in inches	Outside diameter in inches	Inside diameter in inches	Wall thickness	Threads in inches
1/8	0.405	0.269	0.068	1/4
1/4	0.540	0.364	0.088	3/8
3/8	0.675	0.493	0.091	3/8
1/2	0.840	0.622	0.109	1/2
3/4	1.050	0.824	0.113	9/16
1	1.315	1.049	0.133	11/16
1 1/4	1.660	1.380	0.140	11/16
1 1/2	1.900	1.610.	0.145	11/16
2	2.375	2.067	0.154	3/4

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

Review Questions
for
Pipe Fitting

Question	Answer
1. What is NOT one of the ways to measure pipes?	a. Line-to-line b. Center-to-center c. End-to-end d. Face-to-face
2. When will isolation of the system become necessary?	a. Replacing or adding to an active system b. Adding to an inactive system c. Installing a new system
3. What method is used when pipes are NOT connected to the system?	a. Line-to-line b. Center-to-center c. End-to-end d. Face-to-face
4. If changes are made to the system, what should you do?	a. Update as-builts b. Update utility maps c. Update utility blueprints d. Any of the above
5. What actions constitute isolation.	a. Closing valves an tagging b. Installing a stand alone system c. Closing switches and tagging d. Installing a loop system

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

PIPEFITTING

Performance Checklist		
Step	**Yes**	**No**
1. Preparation: a. Did the trainee review blueprints(or as-builts)? b. Did the trainee gather materials needed for preparation phase?		
2. Plan and sketch work: a. Did the trainee visit area and compare with prints? b. Did the trainee make a line drawing of section? c. Did the trainee add fittings and etc.? d. Did the trainee revise sketch to show corrections needed?		
3. Is the trainee able to distinguish between the methods of measurement?		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

PIPING SYSTEMS

MODULE 15 **AFQTP UNIT 8**

ANNUAL (15.8.4.2.)

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

ANNUAL

Task Training Guide

STS Reference Number/Title:	15.8.4.2., Annual
Training References:	• AFM 85-16, Maintenance of Petroleum Systems. • Local Procedures • 3E4X2 CDC
Prerequisites:	• Possess as a minimum a, 3E432 AFSC
Equipment/Tools Required:	• General tool kit • Stethoscope or Ultrasonic probe
Learning Objective:	• The trainee should know the basic steps required to safely perform a piping systems leak test (annual).
Samples of Behavior:	• The trainee should be able to perform a piping system leak test (annual).
Notes:	
• To successfully complete this element follow the steps outlined in the applicable technical manual exactly--no exceptions. • Any safety violation is an automatic failure.	

Notice. This AFQTP is ***NOT*** intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

ANNUAL

Background: A two hour pressure test will be performed on all aboveground and underground piping once a year by using existing installed pumps. Pressure readings are annotated every 15 minutes for the first hour and every half hour for the second hour. These records will be kept on file in the LFM shop for 5 years. Copies of these records will be sent to the MAJCOM Liquid Fuels Engineer when requested.

Inspection Requirements. The underground pipeline should be walked at least twice a year. Leaks in underground pipelines can sometimes be detected by fuel surfacing on the ground, by fuel run-off in the storm drainage system, detection of fuel in underground pits or manholes, or the continuous odor of fuel in a particular area. Above ground off-base pipelines are inspected weekly by line walkers, vehicles, and light aircraft. On-base pipelines should be visually inspected for leaks or drips at the same time that other maintenance is being performed.

SAFETY:
REMOVE ALL JEWELRY BEFORE WORKING ON FUEL SYSTEMS.

NOTE:
Notify Fuels Control Center of systems affected by the pressure test. Review AFM 85-16, CDC's prior to starting the pressure test.

Piping Systems Leak Test (Annual) Procedures.

To perform this task, follow these steps:

Step 1: Identify section of pipe to be tested i.e. refuel, defuel, above and below ground piping. Locate all applicable manual valves to be used for isolation.

Step 2: Prepare checklist with start time, date, weather conditions, and the facility to be tested.

Step 3: Isolate the system to be tested by closing the downstream manual valve.

Step 4: Energize the pump for 30 seconds.

Step 5: Close the manual valve on the outlet side of the pump to trap pressure in the pipeline.

Step 6: Deenergize pump.

Step 7: Annotate starting time, date, and weather conditions.

Step 8: Annotate pressure readings every 15 minutes for the first hour, and every half hour for the second hour.

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

Also, record the time, and weather conditions with each reading.

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

Step 9: Open manual valves to relieve pressure from the pipeline to the tank.

Step 10: Return system to service.

HINT:
Observe entire system being tested for signs of leakage. Also, listen to all manual valves with a stethoscope for internal leakage or relief of pressure.

NOTE:
Any pressure drop will require an explanation and/or on site repair. Any unexplainable pressure drop will require the installation of blind or skillet flanges for positive isolation. Pressure test will then need to be reestablished.

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

Review Questions
for
Annual

Question	Answer
1. An unexplained pipeline pressure drop will require you to?	a. Repeat the test within 60 days. b. Monitor leak until system stabilizes and record results. c. Install blind flanges and retest.
2. What is the minimum time it takes to perform an annual pipeline pressure test?	a. 1 hour b. 2 hours c. 4 hours
3. Annual pipeline pressure tests require the line to be pressurized at 150% normal operating pressure.	a. True b. False

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

ANNUAL

Performance Checklist		
Step	**Yes**	**No**
1. Did the trainee identify section of pipe to be tested, and locate all isolation valves?		
2. Did the trainee prepare checklist with date, time, weather conditions, and test facility?		
3. Did the trainee isolate system to be tested?		
4. Did the trainee energize the pump for 30 seconds?		
5. Did the trainee close the manual valve on the outlet side of the pump to trap the pressure?		
6. Did the trainee de-energize pump?		
7. Did the trainee annotate start time, date, and weather conditions?		
8. Did the trainee annotate readings every 15 minutes for the first hour and 30 minutes for the second hour?		
9. Did the trainee open manual valves to relieve pressure?		
10. Did the trainee return system to service?		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

PIPING SYSTEMS

MODULE 15 **AFQTP UNIT 8**

FIVE YEAR (15.8.4.3.)

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

FIVE YEAR

Task Training Guide

STS Reference Number/Title:	15.8.4.3, Five year
Training References:	• AFM 85-16, chapt 8, Maintenance of Petroleum Systems. • Local Procedures • 3E4X2 CDC
Prerequisites:	• Possess as a minimum a, 3E432 AFSC
Equipment/Tools Required:	• General tool kit • Stethoscope or Ultrasonic probe • Hydrostatic pump
Learning Objective:	• The trainee should know the basic steps required to safely perform a piping systems leak test (5 year).
Samples of Behavior:	• The trainee should be able to perform a piping systems leak test.(5 year)
Notes:	
• To successfully complete this element follow the steps outlined in the applicable technical manual exactly--no exceptions. • Any safety violation is an automatic failure.	

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

FIVE YEAR

Background: A four hour pressure test will be performed on all underground piping every five years by using a hydrostatic hand pump. The pipeline will be pressurized to 150% of it's normal operating pressure. Pressure readings will be recorded every 15 minutes for the first hour and every hour for the remainder of the test. Copies of these records will be sent to the MAJCOM Liquid Fuels Engineer as an attachment to the AF Form 172. If a leak or excessive pressure drop is indicated, then perform a flow test. This is done by repressurizing the line to 150 percent of the normal operating pressure, by using the hand operated hydrostatic pump with a separate reservoir. Measure and record the amount of fluid required to maintain this pressure for a 4 hour period.

SAFETY:
- **REMOVE ALL JEWELRY BEFORE WORKING ON FUEL SYSTEMS.**
- **DO NOT USE WATER ON HYDROSTATIC PRESSURE TESTS**.

NOTE:
Notify Fuels Control Center of systems affected by the hydrostatic pressure test. Review AFM 85-16, CDCs prior to starting pressure test.

Piping Systems Leak Test (5 Year) Procedures:

Step 1: Identify section of underground pipe to be tested. Locate all applicable manual valves that will be closed or removed and blind flanged.

Step 2: Prepare checklist to include: start time, date, weather conditions, and the facility to be tested.

Step 3: Isolate the system to be tested by closing the downstream manual valve or install a blind flange. If double block and bleed valves will hold the pressure, blind flanging is not required.

Step 4: Install hand operated hydrostatic pump. Review manufacturer's manual for operating instructions.

Step :

Step 5: Operate hand pump to achieve 150% of normal operating pressure. Close the manual valve on the outlet side of the pump run test for a 4 hour period.

Step 6: Annotate starting time, date, and weather conditions.

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

Step 7: Annotate pressure readings every 15 minutes for the first hour, and every hour for the remainder of the test. Also, record the time, and weather conditions for each reading. If, a leak or excessive pressure drop is indicated, do a flow test. Do this by repressurizing the line with the hydrostatic pump. Measure and record the amount of fluid required to maintain this pressure for four hours. If a leak is indicated, contact the Environmental Flight and take action to repair it.

HINT:
Observe entire system being tested for signs of leakage. Also, listen to all manual valves with a stethoscope for internal leakage or relief of pressure.

Step 8: Open manual valves to relieve pressure from the pipeline to the tank.

Step 9: Return system to service.

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Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

Review Questions
for
Five Year

Question	Answer
1. Record and forward hydrostatic pressure test results to?	a. Command Fuels Engineer / LFM shop files. b. Fuels Management Officer / LFM Shop Files c. LFM shop files only.
2. Significant pressure drop requires?	a. Record results and forward to Command Fuels Engineer. b. Perform flow test for four hours. c. Energize the pumps and re-pressurize the system. d. Perform a pipeline sample for contaminated fuel.
3. How long is the 5 year test?	a. 4, 1 hour tests. b. 2, 2 hour tests. c. 1, 4 hour test. d. 1, 2 hour test.

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

FIVE YEAR

Performance Checklist		
Step	**Yes**	**No**
1. Did the trainee identify section of pipe to be tested, and locate all isolation valves?		
2. Did the trainee prepare checklist with date, time, weather conditions, and facility?		
3. Did the trainee isolate system to be tested?		
4. Did the trainee install hand operated hydrostatic pump?		
5. Did the trainee operate hand pump to get 150 % above normal operating pressure?		
6. Did the trainee annotate start time, date, and weather conditions?		
7. Did the trainee annotate readings every 15 minutes for the first hour and every hour for the remainder of the test?		
8. Did the trainee open manual valves to relieve pressure?		
9. Did the trainee return system to service?		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

PIPING SYSTEMS

MODULE 15 AFQTP UNIT 8

REPLACE COMPONENTS (15.8.5.)

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

REPLACE COMPONENTS

Task Training Guide

STS Reference Number:	15.8.5., Replace components
Training References:	• AFM 85-16, Maintenance of Petroleum Systems. • Local Procedures • 3E4X2 CDC
Prerequisites	• Possess as a minimum a, 3E432 AFSC
Equipment/Tools Required:	• General tool kit,Drip pan • Flange spreaders • Hydraulic jack • Bonding jumpers
Learning Objective:	• The trainee should know the basic steps required to safely replace pipeline components.
Samples of Behavior:	• The trainee should learn the basic steps required to safely replace pipeline components.
Notes:	
• To successfully complete this element follow the steps outlined in the applicable technical manual exactly--no exceptions. • Any safety violation is an automatic failure.	

Notice. This AFQTP is ***NOT*** intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

REPLACE PIPELINE COMPONENTS

Background: Planning should be accomplished prior to beginning any job such as removing valves, meters, or any other pipeline component. Tools needed to accomplish the task at hand should be gathered and taken to the job sight to prevent unnecessary down time to the fuel system. Also, blind flanges, plugs, caps, or skillet flanges should be taken to ensure fuel system integrity in the event the fuel system has to be left unattended.

NOTE:
- Inform Fuels Control Center of the required maintenance. A fire extinguisher must be on-site and readily available in case of a fire. Review as-built drawings of the fuel system piping. Review CDCs and AFM 85-16 prior to starting work.
- If cathodic protection is installed on underground piping, locate and turn off the main circuit breaker during the removal of pipeline components.

Step 1: Isolate section of pipeline by closing applicable manual valves and perform Lock-out/Tag-out procedures.

HINT:
Verify all pipeline pressure has been relieved prior to loosening the bottom bolts of the flange. This allows fuel to drain safely into a drip pan when the flange is spread.

Step 2: Drain pipeline through low point or a flanged valve. When draining from a flange, place the drip pan underneath and ground it to the system piping.
- Calculate the amount of fuel to be recovered from the pipeline and make necessary arrangements for a defuel truck or a bowser. The volume of one refueling POL vehicle is equal to about 4,000 ft of 6" pipeline

Step 3: Install static bonding cable from flange to flange around the component being removed.

Step 4: Remove the old component from the piping.

NOTE:
Use a hydraulic jack or wood blocks to support the ends of the piping.

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

Step 5: Inspect and clean the face of the flange to ensure old gasket is removed.

Step 6: Install the new component and gaskets.

> **HINT:**
> Use a tapered pin wrench to help with the flange hole alignment flange spreader may be needed to install new gaskets between the flange.

Step 7: Use the criss cross pattern to tighten bolts evenly.

Step 8: Remove the bonding cables from the flanges.

Step 9: Pressurize the pipeline and check for leaks.

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

Review Questions
for
Replacing Pipeline Components

Question	Answer
1. What purpose is there to bonding around the component being removed from the pipeline?	a. Eliminates potential static electricity. b. Prevents stray currents from igniting the fuel. c. Both A and B
2. One refueling vehicle from POL will hold fuel from a 6", 4,000 foot pipeline.	a. True b. False
3. Why is it recommended that you use the criss cross pattern to tighten bolts on a flange?	a. Nothing, it doesn't matter how you tighten them. b. Draws the flange together evenly. c. To prevent the Teflon tape from tearing.

Notice. This AFQTP is ***NOT*** intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

REPLACE PIPING COMPONENTS

Performance Checklist		
Step	**Yes**	**No**
1. Did the trainee isolate section of piping required for maintenance?		
2. Did the trainee drain pipeline through the low point drain or a flanged valve?		
3. Did the trainee install static bonding cable from flange to flange?		
4. Did the trainee remove old component?		
5. Did the trainee inspect the faces of the flanges to ensure the old gaskets are removed?		
6. Did the trainee install the new component and gaskets?		
7. Did the trainee tighten the flanges using the criss cross pattern?		
8. Did the trainee remove the bonding cables?		
9. Did the trainee pressurize and check for leaks?		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

MAINTENANCE OF INSTALLED FUEL SYSTEMS

MODULE 15 **AFQTP UNIT 9**

PERFORM TROUBLESHOOTING PROCEDURES (15.9.)

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

PERFORM TROUBLE SHOOTING PROCEDURES

Task Training Guide

STS Reference Number:	15.9., Perform troubleshooting procedures
Training References:	• AFM 85-16, Maintenance of Petroleum Systems. • Local Procedures • 3E4X2 CDC
Prerequisites	• Possess as a minimum a, 3E432 AFSC
Equipment/Tools Required:	• General tool kit
Learning Objective:	• The trainee should know the basic steps required to safely perform troubleshooting procedures.
Samples of Behavior:	• The trainee should learn the basic steps required to safely perform troubleshooting procedures.
Notes:	
• To successfully complete this element follow the steps outlined in the applicable technical manual. • Any safety violation is an automatic failure.	

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

PERFORM TROUBLE SHOOTING PROCEDURES

Background: It takes time to learn troubleshooting, and plenty of experience to become fully qualified. Even technicians run into seemingly impossible problems now and then. You must know the operation and the function of each component and its relation to the other units in the control system.

The first section of this QTP outlines the process of troubleshooting a Type II fuel system during a refueling operation that has failed. It may be helpful to know that most circuits are equipped with an emergency stop circuit. If this circuit opens, power to all circuits will be de-energized.

SAFETY:
REMOVE ALL JEWELRY BEFORE WORKING ON FUEL SYSTEMS.

Perform Troubleshooting Procedures.

To perform this task follow these steps:

Step 1: The Pumphouse:

- Control panel setup.
- Main control panel circuit has been placed in the ON position.
- Lateral control pit (LCP) selector panel is set to the proper hydrant outlet.
- Pump selector panel is set to the proper pump and in the Auto position.
- Control panel and emergency stops have been reset.

Pump room:

- The pump switch is in the ON position.
- Check the liquid level gauge or stick the tank to ensure the tank has fuel.
- Valves should be configured to issue to the hydrant outlet.
- Check the filter separator sump for water and drain into an approved container.

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

Step 2: Place the magnet on the refuel side of the kiss plate. Check for flow to hydrant outlet. If the inlet pressure gauge in the Lateral control pit indicates pump pressure but no flow to the hydrant outlet go to step 4. If the inlet pressure gauge indicates no pressure then proceed with step 3.

Step 3: Operationally check valves in pump room.

Determine if the Non surge check valve and the rate of flow control valve are functioning properly.

- select the manual position on the pump selector panel.
- Open the appropriate valves to circulate fuel from tank to tank.
- Energize the pump and motor.

NOTE
If the pump did not energize, review the electrical troubleshooting QTP. If fuel does circulate, refer to the automatic valve repair QTP.

If the pump is running and fuel circulates, reconfigure the valves to issue fuel to the desired hydrant outlet. Also set the pump selector panel to the Auto position and proceed to step 4.

Step 4: Lateral Control Pit:

All manual valves should be configured to issue fuelThe solenoid on the LCP wall should be in the On position. Ensure the excess flow shutoff is not tripped Place the magnet on the refuel side of the kiss plate to energize the system, listen to the solenoid on the refueling control valve for an audible click and fuel flow, if there is no flow manually energize the solenoid on the refueling control valve. If the valve opens with the solenoid manually energized, there is a possible problem with the solenoid or the switch on the wall of the LCP. Refer to the electrical troubleshooting QTP. . If the valve does not open, refer to the automatic valve repair QTP and troubleshoot the main valve and its components

Step 5: If after troubleshooting and there is still no flow, contact the Refueling Maintenance shop for possible problems with the hydrant hose cart.

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

Review Questions
for
Perform Troubleshooting Procedures

Question	Answer
1. To ensure that the nonsurge check valve is opening, you need to?	a. Circulate fuel into a tank. b. Perform an excess flow condition and check the rate of flow control valve. c. Adjust the downstream hytrol check. d. Adjust the differential pressure control.
2. Manually energizing the two port solenoid on the refuel control valve, allowing it to open, provides what troubleshooting information?	a. The valve components are functional, except for the solenoid. b. The defuel tank is not high leveled. c. The excess flow shutoff is tripped. d. The switch on the wall is in the ON position.
3. If the filter separator sump is full of water, what effect is there on the rest of the fuel system?	a. Excessive pressure downstream will trip the excess flow control. b. The differential flow control will allow water to pass through the filter separator. c. Water in the fuel piping will discharge to bulk storage. d. The rate of flow control valve will not open.
4. Resetting the emergency stop circuit will _____.	a. Disable the refueling circuit. b. Restores power to all circuits. c. disables the refueling circuit. d. Energizes the pump house lighting.

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

PERFORM TROUBLE SHOOTING PROCEDURES

Performance Checklist		
Step	**Yes**	**No**
1. Fuel system fails to pump fuel during a refueling operation: a. Did the trainee check the pump house set up? b. In the Control room, did the trainee check that the Main Control Panel is in the ON position? c. Did the trainee check that the LCP selector panel is set to the proper hydrant outlet? d. Did the trainee check that the pump selector panel is set to the proper pump, and in the ON position? e. In the Pump room, did the trainee check that the pump switch is in the ON position? f. Did the trainee check that the liquid level gauge or stick in the tank for fuel? g. Did the trainee check that the valves are configured to issue to the hydrant outlet? h. Did the trainee check for water in the filter seperator pump?		
2. Energize system: a. Did the trainee place the magnet on the kiss plate? b. Did the trainee check the pressure guage for pump pressure? c. Did the trainee check for flow to hydrant? d. Did the trainee go to step 3 or step 4?		
3. Operationally check valves in Pump room: a. Did the trainee select the manual position on the pump selector panel? b. Did the trainee open the appropriate valves to circulate? c. Did the trainee energize the pump and motor? d. Did the trainee perform troubleshooting?		
4. Lateral Control Pit: a. Did the trainee check that the manual valves are configured to issue fuel? b. Did the trainee check that the solenoid switch is in the ON position? c. Did the trainee check that the excess flow shutoff in not in the tripped position? d. Did the trainee energize the system and listen for an audible click from the solenoid and that fuel is flowing through the valve? e. Did the trainee manually energize the solenoid on the Refuel Control Valve if fuel in not flowing to the hydrant outlet? f. Did the trainee refer to applicable QTP's or other technical data when problems were encountered?		

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

PERFORM TROUBLE SHOOTING PROCEDURES

Performance Checklist		
Step	**Yes**	**No**
5. Did the trainee contact Refueling Maintenance?		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

GAUGES

MODULE 15 AFQTP UNIT 10

CALIBRATE (15.10.1.2.)

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

CALIBRATE

Task Training Guide

STS Reference Number:	15.10.1.2., Calibrate
Training References:	• AFM 85-16, Maintenance of Petroleum Systems. • Manufacturers Manual • 3E4X2 CDC's
Prerequisites:	• Possess as a minimum a, 3E432 AFSC
Equipment/Tools Required:	• General tool kit • Pressure Gauge Tester • Teflon Tape
Learning Objective:	• The trainee should learn basic steps required to safely calibrate a pressure gauge using a pressure gauge tester.
Samples of Behavior:	• Trainee should be able to perform a calibration on a pressure gauge using a pressure gauge tester.
Notes:	
• To successfully complete this element follow the steps outlined in the applicable technical manual exactly--no exceptions. • Any safety violation is an automatic failure.	

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

CALIBRATE

Background: There are many types of pressure gauges throughout the fuel system, but the main function of all of them is to tell us how well the system is operating. A simple pressure gauge calibration, using a hydraulic pressure gauge tester, will be used as an example for this QTP. Pressure gauges require calibration once each year or when malfunctioning.

SAFETY:
REMOVE ALL JEWELRY BEFORE WORKING ON FUEL SYSTEMS.

NOTE:
Review AFM 85-16 ch. 10 for calibration requirements, 3E4X2 CDCs, manufacturer's manual for the hydraulic gauge tester. Follow local procedures for calibrations of pressure gauges. Master gauges should be calibrated by Precision Measurement Laboratory annually.

To perform this task, follow these steps:

Step 1: Close the manual valve to isolate the gauge to be tested.

Step 2: Remove the gauge from the fuel system.

Step 3: Select the proper master gauge that represents the appropriate pressure range.

Step 4: Close the pressure release line on the tester.

HINT:
Calibration will be achieved by testing the low, middle, and high pressure gauges.

Step 5: Apply Teflon tape to the threads of the test gauge and master gauge. Install gauges on the gauge tester.

Step 6: Pump the handle to increase pressure, compare the test gauge readings with the master gauge readings at the low, middle, and high pressure range.

NOTE:
Refer to the applicable manufacturer's manual for pressure gauge needle adjustments.

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

Step 7: Release pressure from the tester and perform the test a minimum of two more times.

Step 8: Remove gauges from the tester, apply teflon tape to the threads of the calibrated gauge and reinstall.

Step 9: Stencil or use embossing tape to place calibration due date on the gauge. Record new calibration date, annotate local records as required.

Step 10: Open manual isolation valve to the gauge.

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

Review Questions
for
Calibrate

Question	Answer
1. What is the frequency of calibration for pressure gauges?	a. Semi Annual b. Annual c. 5 year d. Calibration not required.
2. When performing calibrations, compare pressure readings on the master and test gauges at what intervals?	a. Low pressure level b. Middle pressure level. c. High pressure level d. All of the above
3. When selecting a master gauge, you should?	a. Be close in pressure, yet exceed it. b. Find the highest pressure value you can find. c. Select a gauge with half the value and multiply by two. d. Find a differential pressure gauge.

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

CALIBRATE

Performance Checklist		
Step	**Yes**	**No**
1. Did the trainee close manual valve to isolate gauge?		
2. Did the trainee remove the gauge from the system?		
3. Did the trainee select the proper master gauge that represents the appropriate pressure range?		
4. Did the trainee close the pressure relief line on the tester?		
5. Did the trainee apply Teflon tape to the threads of the master and test gauges, and install on the hydraulic tester?		
6. Did the trainee pump the handle to increase the pressure, compare the readings at the low, middle, and high pressure range?		
7. Did the trainee release the pressure from the tester and perform test a minimum of two times?		
8. Did the trainee remove gauge from the tester, Teflon tape the threads, install the gauge in the system?		
9. Did the trainee stencil new calibration date on the gauge, record date, and annotate local records as required?		
10.Did the trainee open the manual valve?		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

AUTOMOTIVE GASOLINE DISPENSING SYSTEM

MODULE 15 AFQTP UNIT 11

CALIBRATE METERS (15.11.3.)

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

CALIBRATE METERS

Task Training Guide

STS Reference Number:	15.11.3., Calibrate meters
Training References:	• AFM 85-16, Maintenance of Petroleum Systems. • Local Procedures • 3E4X2 CDC • Manufacturer's Manual
Prerequisites	• Possess as a minimum a, 3E3X2 AFSC
Equipment/Tools Required:	• General tool kit • 5 Gallon Prover Can
Learning Objective:	• The trainee should know the basic steps required to safely calibrate automotive gasoline dispensing systems.
Samples of Behavior:	• The trainee should learn the basic steps required to safely calibrate automotive gasoline dispensing systems.

Notes:

- To successfully complete this element follow the steps outlined in the applicable technical manual exactly--no exceptions.
- Any safety violation is an automatic failure.

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

CALIBRATE METERS

Background: The Air Force has many different types of dispensing pumps. Some are plain and record only the number of gallons dispensed, while others of more modern design compute price as well as gallonage. The only source of detailed information you will have on various dispensers are the manufacturers manual. However, once you learn the general design and operating principles of one typical dispensing unit, you have little trouble understanding the design and operating principles of any type of dispenser you may encounter. Automotive dispensing units must be calibrated annually to within 0.2% accuracy.

SAFETY:
REMOVE ALL JEWELRY BEFORE WORKING ON FUEL SYSTEMS.

NOTE:
Inform Fuels Control Center of the required maintenance. Review Manufacturer's manual, CDCs and AFM 85-16 prior to starting work.

Step 1: Coordinate with fuels storage superintendent before performing calibration

Step 2: Remove the dispensers lower access panels and the lead seal from the calibrator.

Step 3: Position 5 Gallon prover can near the dispenser to be tested.

Step 4: Energize dispenser and pump 5 gallons according to the dispensers register. Taking precautions to not overfill the prover can.

Step 5: Compare register reading with the prover can level, readings must be within 0.2% accuracy. If accurate follow steps 7, 9, and 10.

Step 6: Remove the seal pin, which allows the index disc to be turned either to the right, to decrease the measurement; or to the left, to increase the measurement.

HINT:
Refer to manufactures manual if adjustments are necessary.

Step 7: Return product in prover can back to the system.

Step 8: Repeat steps 2-6 as necessary.

Step 9: Return system to service.

Step 10: Record next date due according to local policy

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

Review Questions for Calibrate Meters

Question	Answer
1. The minimum gallons dispensed into the prover can for meter calibration is?	a. 6 Gallons b. 10 Gallons c. 5 Gallons d. 2 Gallons
2. What is the calibration frequency of an automotive dispensing system?	a. Quarterly b. Semi-Annual c. Annually d. Bi-Annually
3. What is the allowable tolerance for calibration on automotive dispensers?	a. 2.0% b. 0.2% c. 0.002% d. 20%

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

CALIBRATE METERS

Performance Checklist		
Step	**Yes**	**No**
1. Did the trainee coordinate with fuels storage superintendent?		
2. Did the trainee remove the lower access panels to the dispenser?		
3. Did the trainee position the 5 gallon prover can?		
4. Did the trainee energize dispenser and pump 5 gallons according to the dispensers register?		
5. Did the trainee compare the registers reading with the level of the prover can and follow steps accordingly?		
6. Did the trainee remove the seal pin and adjust the index disc accordingly?		
7. Did the trainee return product to the system?		
8. Did the trainee repeat steps 2-6 as necessary?		
9. Did the trainee return system to service?		
10. Did the trainee record next due date?		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

AUTOMOTIVE GASOLINE DISPENSING SYSTEM

MODULE 15 **AFQTP UNIT 11**

REPLACE (15.11.4.1.)

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

REPLACE

Task Training Guide

STS Reference Number:	15.11.4.1., Replace
Training References:	• AFM 85-16, Maintenance of Petroleum Systems. • Local Procedures • 3E4X2 CDC • Manufacturer's Manual
Prerequisites	• Possess as a minimum a, 3E3X2 AFSC
Equipment/Tools Required:	• General tool kit • • 24" Offset pipewrench • 24" Pipewrench • 5 Gallon Prover Can
Learning Objective:	• The trainee should know the basic steps required to safely replace automotive gasoline dispensing systems.
Samples of Behavior:	• The trainee should learn the basic steps required to safely replace automotive gasoline dispensing systems.

Notes:

- To successfully complete this element follow the steps outlined in the applicable technical manual exactly--no exceptions.
- Any safety violation is an automatic failure.

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

REPLACE

Background: The Air Force has many different types of dispensing pumps. Some are plain and record only the number of gallons dispensed, while others of more modern design compute price as well as gallonage. The only source of detailed information you will have on various dispensers are the manufacturers manual. However, once you learn the general design and operating principles of one typical dispensing unit, you have little trouble understanding the design and operating principles of any type of dispenser you may encounter.

ŞÀFETY:
REMOVE ALL JEWELRY BEFORE WORKING ON FUEL SYSTEMS.
PERFORM LOCK-OUT / TAG-OUT PROCEDURES.

NOTE:
Inform Fuels Control Center of the required maintenance. Base notification may be required before the start of work. Review Manufacturer's manual, CDCs and AFM 85-16 prior to starting work.

Step 1: Perform lock out/ tag out procedures .

Step 2:. Remove old dispenser

- Contact an electrician to disconnect of wiring
- Drain the unit into a drip pan (if possible)
- Disconnect the union and remove the nuts from the anchor bolts.
- Remove dispenser from pedestal.

Step 3: With assistance, position dispenser squarely on the concrete pedestal.Align and connect union.

Note:
If your dispenser works with a submersible pump, install a spring loaded closed emergency shutoff valve with a fusible link in accordance with NFPA 30.

Step 4: Call an electrican to connect wires to dispenser.

NOTE:
Local procedures may dictate whether LFM or Electric shop connects electrical connections. Refer to the applicable manufacturer's manual for accurate wiring schematics.

Step 5: Anchor and ground the dispensing unit to the pedestal.

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Step 6: Remove Lock-Out / Tag-Out.Step 7: Energize the pump, pressurize and check for leaks.

Step 8: Refer to Calibrate meter QTP for calibration instructions.

Step 9: Return system to service.

NOTE:
In accordance with NFPA 30, break away hose connections are required on all fuel dispensers.

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Review Questions
for
Replace

Question	Answer
1. Emergency shutoff valves are only required for diesel dispensers.	a. True b. False
2. New dispenser installations do not require initial calibration because they are calibrated by the manufacturer.	a. True b. False

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REPLACE

Performance Checklist		
Step	**Yes**	**No**
1. Did the trainee perform lock out/ tag out proceedures?		
2. Remove old dispenser: a. Did trainee call electrician? b. Did trainee drain unit? c. Did trainee disconnect union and remove nuts? d. Did trainee remove dispenser from pedestal?		
3. Did the trainee place dispenser squarely on pedestal and align union?		
4. Did the trainee Call electrician?		
5. Did the trainee anchor and ground the dispensing unit to the pedestal?		
6. Did the trainee remove Lock-out / Tag-out?		
7. Did the trainee energize pump and check for leaks?		
8. Did the trainee refer to calibration QTP for initial calibration instructions?		
9. Did the trainee return system to service?		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.

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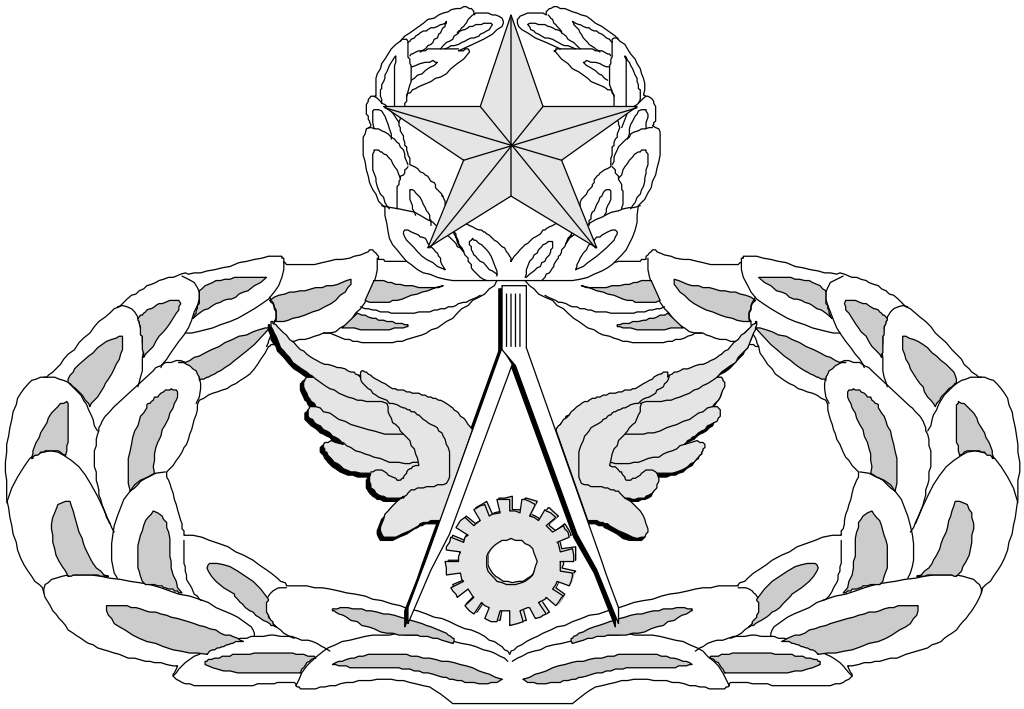
Air Force Civil Engineer
QUALIFICATION TRAINING PACKAGE (QTP)

REVIEW ANSWER KEY



For

LIQUID FUEL SYSTEMS MAINTENANCE

(3E4X2)

MODULE 15

MAINTENANCE OF INSTALLED FUEL SYSTEMS

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REPAIR
(3E4X2-15.1.4.)

Question	Answer
1. If repairs are required to an Excess flow shutoff control, what would you attempt first?	b. Reset and adjust.
2. What maintenance action is required for a worn disc in the main valve body?	b. Flip over or replace.
3. When tubing on the pressure reducing control kinked, what action would you take?	d. Remove and replace.
4. On most automatic valves, if diaphragms are not seated properly, what is the first action taken?	b. Tighten the diaphragm washer nut.

ADJUST
(3E4X2-15.2.2.)

Question	Answer
1. Blackmer rotary vane pumps are capable of multiple gpm's?	a. True
2. What is the purpose of the gear box?	c. Adjust downstream gpm's.
3. What is the purpose of the pressure control valve?	a. Relieve excess downstream pressure to the suction side of the pump.
4. Positive displacement pumps can be classified as centrifugal pumps?	b. False

REPLACE
(3E4X2-15.2.4.1.)

Question	Answer
1. When do you replace mechanical seals?	d. If scratched or if the stationary seat is chipped
2. Why is it necessary to Lock-Out / Tag-Out systems when replacing a mechanical seal.	d. Both B and C
3. Teflon tape, when applied to the pump shaft threads, prevents?	c. Damage to internal mechanical seal O-ring.

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ADJUST
(3E4X2-15.2.4.2.)

Question	Answer
1. Setting gauges or spacers are used for what?	b.Adjust spring tension
2. Setting gauges or spacers should be discarded in the trash.	b. False
3. Performing an operational check is mandatory.	a. True

REPLACE FILTER ELEMENT CARTRIDGES
(3E4X2-15.3.2.)

Question	Answer
1. Gravity filling from vessel to vessel helps eliminate static electricity.	a. True
2. Installing elements using the plastic covering prevents what?	a. Deterioration of elements coalescing ability.

CALIBRATE METERS
(3E4X2-15.4.2.)

Question	Answer
1. Liquid Controls and A.O. Smith meters require how many gallons for flushing the system?	c. 100 gallons
2. What is the purpose of flushing the system?	a. To eliminate air and fill the lines and valves with fuel.
3. Permanently installed Brodie meters require how many tests to be properly calibrated?	c. As many as needed
4. What is a thermometer used for?	b. Checking the temperature of the fuel.
5. Installed fuel meters must be calibrated to within what percentage?	c. 0.2%.
6. The final step after calibration procedures are complete are?	d. All the above.

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PERFORM PIPE THREADING
(3E4X2-15.8.2.)

Question	Answer
1. When operating a power threader, what should not be used?	d. Gloves
2. What do you look for when performing a visual inspection of dies?	d. All of the Above
3. The purpose of cutting oil is to reduce _____ and _____.	b. Friction and heat.
4. How are burrs removed?	d. With a reamer
5. What is a good way to verify properly cut threads?	b. Make two to three easy turns by hand with a female fitting.

PERFORM PIPE FITTING
(3E4X2-15.8.3.)

Question	Answer
1. What is NOT one of the ways to measure pipes?	a. Line-to-line
2. When will isolation of the system become necessary?	a. Replacing or adding to an active system
3. What method is used when pipes are NOT connected to the system?	c. End-to-end
4. If changes are made to the system, what should you do?	d. Any of the above
e. What actions constitute isolation.	a. Closing valves an tagging

ANNUAL
(3E4X2-15.8.4.2.)

Question	Answer
1. An unexplained pipeline pressure drop will require you to?	c. Install blind flanges and retest.
2. What is the minimum time it takes to perform an annual pipeline pressure test?	b. 4 hours
3. Annual pipeline pressure tests require the line to be pressurized at 150% normal operating pressure.	b. False

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FIVE YEAR
(3E4X2-15.8.4.3.)

Question	Answer
1. Record and forward hydrostatic pressure test results to?	a. Command Fuels Engineer / LFM shop files.
2. Significant pressure drop requires?	b. Perform flow test for four hours.
3. How long is the 5 year test?	c. 1, 4 hour test.

REPLACING PIPELINE COMPONENTS
(3E4X2-15.8.5.)

Question	Answer
1. What purpose is there to bonding around the component being removed from the pipeline?	c. Both A and B
2. One refueling vehicle from POL will hold fuel from a 6", 4,000 foot pipeline.	a. True
3. Why is it recommended that you use the criss cross pattern to tighten bolts on a flange?	b. Draws the flange together evenly.

PERFORM TROUBLESHOOTING PROCEDURES
(3E4X2-15.9.)

Question	Answer
1. To ensure that the nonsurge check valve is opening, you need to?	a. Circulate fuel into a tank.
2. Manually energizing the two port solenoid on the refuel control valve, allowing it to open, provides what troubleshooting information?	a. The valve components are functional, except for the solenoid.
3. If the filter separator sump is full of water, what effect is there on the rest of the fuel system?	d. The rate of flow control valve will not open.
4. Resetting the emergency stop circuit will_____.	b. Restores power to all circuits.

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CALIBRATE
(3E4X2-15.10.1.2.)

Question	Answer
1. What is the frequency of calibration for pressure gauges?	b. Annual
2. When performing calibrations, compare pressure readings on the master and test gauges at what intervals?	d. All of the above
3. When selecting a master gauge, you should?	a. Be close in pressure, yet exceed it.

CALIBRATE METERS
(3E4X2-15.11.3.)

Question	Answer
1. The minimum gallons dispensed into the prover can for meter calibration is?	c. 5 Gallons
2. What is the calibration frequency of an automotive dispensing system?	c. Annually
3. What is the allowable tolerance for calibration on automotive dispensers?	b. 0.2%

REPLACE
(3E4X2-15.11.4.1.)

Question	Answer
1. Emergency shutoff valves are only required for diesel dispensers.	b. False
2. New dispenser installations do not require initial calibration because they are calibrated by the manufacturer.	b. False

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